5.0 RADIOACTIVE WASTE MANAGEMENT

The radioactive waste management and disposal systems at SONGS 1 were designed to provide controlled handling and release or disposal of liquid, gaseous, and solid wastes generated. Plant personnel and the general public are protected from significant exposure to radiation from wastes. Releases of radioactive nuclides in either liquid or gaseous wastes discharged from the plant during Decommissioning are a small fraction of the quantity permitted under 10 CFR 20. Additionally, the objective is to meet the numerical guidelines outlined in 10 CFR50, Appendix I, regarding "as low as is reasonably achievable."

Liquids are collected and processed by filtration prior to discharge to the ocean. The gas treatment systems are no longer required. There is no generation of fission product gases. The radiation monitoring system for airborne discharges has been demolished. Solid wastes are stored, packaged and shipped offsite for either (1) direct disposal at licensed burial facilities or (2) volume reduction licensed waste processor(s).

5.1 RADIOLOGICAL HISTORY

Fuel cladding leakage occurred during several fuel cycles at SONGS 1. Monitoring programs such as primary chemistry, effluent chemistry and health physics detected fission product contamination and characterized the typical constituents of fission products and corrosion products. Activity of these isotopes could be found throughout systems that handled liquids and gases during normal operation.

The unit had a history of steam generator tube leakage. For this reason, secondary systems were considered suspect and were treated as such under the administrative programs. Similarly, liquid systems interfacing with known contaminated systems through heat exchangers were also considered suspect due to the possibility of tube leakage during operation. All plant sumps and drains were considered suspect, or were known to be contaminated and were also regarded as potentially contaminated.

5.2 CURRENT RADIOLOGICAL STATUS

The Health Physics (HP) Division monitors and controls the radiological status of all Unit 1 areas and Decommissioning activities. At any time, current information on radiation and contamination levels is available from HP. The survey sheet presented in Figure 3.1-1 is an example of the radiological information that is maintained and utilized by HP in controlling work and protecting personnel.

The quantities of radioactive nuclides discharged from the SONGS 1 facility are presented in the Annual Radioactive Effluent Release Reports.[1]

With the cessation of operation in 1992, and the ensuing period of inactivity, the current inventories and normal releases of radioactivity at SONGS 1 have been greatly reduced from those which existed shortly after plant shutdown. The potential consequences of an accident or uncontrolled release are also much lower. Current conditions are very conservatively bounded by those that existed shortly after plant shutdown. These bounding values for activities, inventories and releases of radioactive products are included in Section 5.1 of Appendix A, Historical Information, as a point of reference.

5.2.1 SPENT FUEL POOL

All spent fuel assemblies and hardware have been transferred to the Independent Spent Fuel Storage Facility (ISFSI).

An activation analysis of the reactor vessel and its internals was performed to generate radioactivity levels in these components (Reference 2). The results expressed in units of curies were used to segment the waste into low level radioactive waste shipments for near surface disposal and greater than Class C (GTCC) waste to be stored in the ISFSI. The total activity calculated for the vessel and non-GTCC internals as of 04/01/2002 was less than 5.0E+04 Curies. The total GTCC activity level calculated was less than 3.5 E+05 as of 04/01/2002. GTCC waste has been transferred to the ISFSI. The Reactor Vessel remains stored on site.

5.2.2 DELETED

5.2.3 AIRBORNE RELEASES

Current airborne releases are well below the requirements of 10 CFR 20.106(b); 10 CFR 20 Appendix B Table II; and 10 CFR 50 Appendix I.

All building structures that previously contained, handled and or processed radioactive liquids and gases have been demolished. There are no more sources of noble gases or iodine. Local engineering controls are implemented to control the production of particulate airborne material and are assessed by Health Physics local air sampling.

5.2.4 ESTIMATED DOSES FOR AIRBORNE RELEASES

Experience since plant shutdown has indicated that airborne radioactive releases are only a very small fraction of the allowable limits given in 10 CFR 20 Appendix B Table II.

5.2.5 LIQUID RELEASES

All no plant liquid discharge systems have been demolished. Any liquid radwaste that is created is dispositioned per the site procedure SO123-XV-29.

5.2.6 ESTIMATED DOSES FOR LIQUID RELEASES

The calculated dose or dose commitment to a member of the public from radioactive materials in liquid effluents released to unrestricted areas is limited during any calendar quarter to <1.5 mrem to the total body and to <5 mrem to any organ and during any calendar year to <3 mrem to the total body and to <10 mrem to any organ. These dose allowances are in compliance with 10 CFR 50 Appendix I and 10 CFR 20.

5.2.7 DELETED

5.2.8 REFERENCES

1. San Onofre Nuclear Generating Station Radioactive Annual Effluent Release Report, June 1996.
2. SO1-207-1-M106, San Onofre Nuclear Generating Station Unit 1 Reactor Vessel and Internals Characterization, Report WMG-20004-9088.

5.3 DELETED

5.3.1 (DELETED)

5.3.2 (DELETED)

5.3.3 (DELETED)

5.3.4 DELETED

5.4 DELETED

5.5 SOLID WASTE

The handling of solid radwaste generated during all phases of Decommissioning is described in the following subsections.

The major sources of dry active waste are debris generated by building demolition and material removed from the plant as a part of Decommissioning. Controlled dismantlement methods are used to minimize the radioactive waste volume produced and to prevent the spread of contamination.

5.5.1 DESIGN OBJECTIVES

The solid radwaste is packaged and stored until it is shipped offsite for permanent disposal at a licensed burial facility. The solid wastes are generated by dismantling and demolition activities.

The design objectives may be stated as follows:

(1) To provide a means for collecting and processing the plant's radioactive waste streams in accordance with both regulatory and burial site criteria;

(2) To maintain any potential radiation exposure to plant personnel and the environment, as a result of the packaging, within the dose limits of 10CFR20 and 10CFR50; and

(3) To package the plant's solid radioactive wastes in conformance with the requirements of 10CFR61 and 10CFR71.

5.5.2 DELETED

5.5.3 SOLID RADWASTE EQUIPMENT AND PROCESSES

5.5.3.1 (DELETED)

5.5.3.2 Deleted

5.5.3.3 Dry Active Waste Collection and Processing

The radioactive trash collected from the plant radioactive work areas may contain compactible dry active waste, noncompactible dry active waste, wet waste, and protective clothing. These items are segregated and collected in their respective receptacles at the exit point of the contaminated work area. The trash is collected from these receptacles and is packaged according to its classification.

The collection containers (plastic bags) of dry active waste are inspected for other classes of waste such as noncompactible waste or "wet trash" before the dry active waste is loaded into a container. Compactible dry active waste is generally packaged and shipped offsite to a vendor who performs volume reduction.

The noncompactible waste is packaged in strong tight containers. After placing the maximum capacity of metallic objects in each box, the voids may be further filled by sifting sand/dirt or rubble into the box. The box is sealed and staged for shipment.

The wet trash is segregated and packaged into appropriate containers using appropriate operating procedures and controls to keep exposure ALARA.

The protective clothing collected from receptacles is packaged and transported offsite to a licensed facility for cleaning. If the protective clothing is determined to be not reusable, it is packaged according to directions for the disposition and burial offsite of compactible dry active waste or wet waste.

5.5.3.4 (DELETED)

5.5.3.5 Solidification Program for Wet Wastes

At present, the solidification of SONGS solid radwaste is not accomplished at the site. However, packaging waste by solidification is feasible at SONGS 1. To ensure that the packaged waste would meet the burial site and regulatory requirements for packaging and shipping, the qualified service contractors must supply detailed information to SCE about the solidification process, the sampling program, verification for free standing water, and exothermic process considerations. The information is evaluated before the service contract is awarded. After the award of contract, any special procedures required for this operation, such as sampling to ensure solidification and verification of the free standing water, are reviewed and may be accepted or rejected.

5.5.3.5.1 Deleted

5.5.3.6 Deleted

5.5.4 PACKAGING

Before packaging, the solid radioactive waste is evaluated and classified in accordance with the requirements of 10 CFR 61. This classification determines the manner in which the solid radioactive waste is handled, packaged, labeled, and prepared for shipment in order to comply with all applicable regulations.

Several sizes of containers are used for packaging the radioactive solid waste. The dry active waste may be compressed into 55-gallon drums or, when noncompactible, packaged in strong tight containers of different dimensions. The wet solid waste materials are rendered dry prior to packaging and/or disposal.

The packaging containers conform to the applicable regulatory requirements of 10 CFR and 49 CFR and the criteria specified in the burial site licenses for receiving and burying solid radioactive waste.

5.5.5 DISMANTLEMENT, DECONTAMINATION, AND DISPOSAL

During Decommissioning SCE may decontaminate and dismantle the contaminated structures, systems and components (SSC) by decontamination in place, dismantlement and decontamination, dismantlement and disposal, or a combination of these methods. Buildings will be dismantled and prepared for disposal. Appropriate methods will be selected for particular situations with the objectives of safely and efficiently removing the SSC while reducing contamination levels and worker exposure.

5.5.5.1 Decontamination Methods

Contaminated systems and components are removed and sent to a processing facility or to a LLRW disposal facility. Onsite decontamination is generally limited to activities needed to maintain personnel exposure as low as reasonably achievable (ALARA), to expedite equipment removal, and to minimize the spread of contamination. Decontamination may also be conducted as part of volume reduction or as a step in the process to free release an item.

Fixation or removal of loose surface contamination is accomplished primarily by application of coatings and wiping. Airborne contamination control and waste processing systems are used, as necessary, to control and monitor such contamination if other methods are used, e.g., grit blasting or high pressure water. Openings in components are covered and sealed to minimize the spread of contamination as components are moved to packaging areas.

5.5.5.2 Dismantlement

Controlled dismantlement methods will be used to remove SSC. Two basic types of dismantlement are mechanical and thermal.

Mechanical methods, those which machine the surfaces of the material being cut, typically do not generate significant amounts of contamination. This attribute makes these methods attractive for cutting contaminated piping and components. The outside diameter machining method is best suited for large bore piping. Smaller bore piping and supports can be cut using any of the mechanical methods, e.g., saws, reciprocating saws and hydraulic shears.

Thermal methods melt or vaporize the surfaces of the material being cut. The cutting debris is transported from the cut region with a gas jet or water spray. Although thermal methods are significantly quicker than mechanical methods, they generate airborne contamination. Contamination control and effluent control measures are implemented, as appropriate, to minimize worker exposure and the potential for an unmonitored effluent release. HP&E Position Paper "Airborne Effluent Controls During Decommissioning," dated September 27, 2000, provided additional guidance on effluent control measures to minimize airborne effluents.

5.5.5.3 Processing Building Debris and Dismantled Equipment

LLRW will be processed in accordance with plant procedures and shipped to an offsite processing facility or LLRW disposal facility. No incineration will occur onsite.

Concrete which cannot be decontaminated will be packaged and shipped to a LLRW disposal facility. Contaminated structural steel components may be removed to an onsite processing area for decontamination, volume reduction, and packaging for shipment to an appropriate facility.

5.5.5.4 Soil Remediation

Soils and asphalt pavement will be surveyed and characterized in accordance with the Site characterization program. As necessary, soil and pavement will be removed, processed, and disposed of at a licensed LLRW processing or disposal facility if determined to contain contamination levels above those required for compliance with 10CFR20, Subpart E.

5.5.6 STAGING, PROCESSING AND STORAGE FACILITIES

Several areas may be used for the processes of decontamination, segregation, storage and packaging radioactive waste. Section 6.1 describes the South Yard Facility (SYF), and the Units 2&3 Truck Bay. The Multipurpose Handling Facility (MPHF), is described in this section.

The MPHF is an in-process staging area for the accumulation of solid radwaste until it is released for shipment. The MPHF consists of an office building, a staging building, and an equipment pad. The facility is surrounded by a gated chain link fence. The MPHF is located at the southern edge of the SONGS owner-controlled area. The location of the facility with respect to SONGS 1 is presented in Figure 2.1.

The following subsections present a general overview of each area.

5.5.6.1 Office Building and Equipment Pad

The office building houses the office, control room, equipment room, and locker rooms, and also serves as the main personnel access to the MPHF. The equipment pad is on the east side and adjacent to the office building. Located on the equipment pad are the air handling units ductwork and effluent monitoring equipment for the staging building.

5.5.6.2 Truck Bay

The truck bay is 67 feet long and 12 feet wide and is surrounded by the loading dock and walkway areas, which are 4 feet above the floor level of the truck bay. The roll-up door opening is 14 feet high by 11 feet 6 inches wide.

Above the east walkway is a leaded glass view port that allows containers in the sample vault to be inspected. Also located in the truck bay is the sump discharge station, a personnel decontamination shower, and a frisking station. A ladder with a locking hatch cover leads from the walkway to the maintenance area. In the northwest corner of the truck bay is an emergency exit leading directly to the outside ground level.

5.5.6.3 Maintenance Area

The maintenance area is located east of the truck bay and serves as a work area and a shielding labyrinth. Housed there is the pump, the hydrogen purge station, the container decontamination spray system, and the swiper arm. A floor plug covers the sump drain valves and also serves as the sump lid.

Personnel access to the maintenance area is by way of a ladder extending from the truck by a walkway area. Access for containers is through an opening in the labyrinth west wall, 10 feet wide and covered with a sliding safety gate.

5.5.6.4 North Staging Area

The north staging area for the high specific activity containers of solid radwaste, consists of the sample vaults, the main vault, and the floor staging area surrounding the vaults. Each sample vault is a separate cubicle with an individual lid. Access for containers is through an opening 11 feet wide in the labyrinth east wall. Personnel access to this area requires installation of a temporary ladder.

5.5.6.5 South Staging Area

In the south staging area, roll-up door 8 feet wide by 11 feet 11 inches high opens into 3200 square feet of floor space designed to accommodate pallets of drums and LSA boxes of dry active waste (low specific activity). An emergency exit is located at the east wall. Outside the roll-up door is an equipment storage room and the forklift charging station. The south staging area is section lined to provide a method of accountability and location for the packaged solid radwaste awaiting shipment.

5.5.7 SHIPMENT

Shipping casks and radwaste packages are used to transport the waste from the site to the burial ground. A contract trucking firm is hired to transport the shipping cask and radwaste packages to the burial site. Shipping casks waiting to be loaded are stored near the MPHF.

Depending on the activity level and waste classification, some of the dry active waste may be transported in a covered van or on a flatbed trailer without requiring placement in a shipping cask.

Intermodal containers and gondolas are used for shipping large components and bulk materials by rail.

5.5.8 DELETED

5.6 DELETED

5.6.1 DELETED

5.6.2 DELETED

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5.6.4 DELETED

5.6.5 DELETED

TABLE 5-1
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TABLE 5-5
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